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DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ALGEBRA.

198. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, O.

Solve $2^{x+y}=6^y$; $3^x=3.2^{y+1}$.

Solution by G. B. M. ZERR, A. M., Ph. D., Parsons, W. Va., and A. H. HOLMES, Brunswick, Me.

$2^{x+y}=6^y$, gives $2^x=3^y$ (1), $3^x=3.2^{y+1}$, gives $3^{x-1}=2^{y+1}$ (2).

(1) multiplied by (2) gives $6^x=6^{y+1}$ (3).

From (1), $x/y=\log 3/\log 2$; from (3), $x=y+1$.

$\therefore y=\log 2/(\log 3-\log 2)$, $x=\log 3/(\log 3-\log 2)$.

Also solved by F. D. POSEY, J. E. SANDERS, G. W. GREENWOOD, CHRISTIAN HORNING, L. E. NEWCOMB, J. SCHEFFER, GRACE M. BARELS, and the Proposer.

199. Proposed by SAUL EPSTEIN, Ph. D., Chicago, Ill.

Solve $(x-a_1)(x-a_2)(x-a_3)(x-a_4)(x-a_5)(x-a_6)=(x+a_1)(x+a_2)(x+a_3)(x+a_4)(x+a_5)(x+a_6)$.

Solution by F. D. POSEY, A. B., San Mateo, Cal., and G. B. M. ZERR, A. M., Ph. D., Parsons, W. Va.

Let $p_1=\sum a_1$, $p_2=\sum a_1 a_2$, etc. Expanding both members of the equation we have $x^6-p_1 x^5+p_2 x^4-p_3 x^3+p_4 x^2-p_5 x+p_6=x^6+p_1 x^5+p_2 x^4+p_3 x^3+p_4 x^2+p_5 x+p_6$, which reduces to $p_1 x^5+p_3 x^3+p_5 x=0$. One root is therefore 0. Dividing by x , we have $p_1 x^4+p_3 x^2+p_5=0$.

Solving the latter as a quadratic we have $x^2=[-p_3 \pm (p_3^2-4p_1 p_5)^{\frac{1}{2}}]/2p_1$.

$\therefore x=\pm \left[\frac{-p_3 \pm (p_3^2-4p_1 p_5)^{\frac{1}{2}}}{2p_1} \right]^{\frac{1}{2}}$.

Since the original equation is of the sixth degree, one root is infinite.

Also solved by G. W. GREENWOOD, B. A. (Oxon), and L. E. NEWCOMB.

GEOMETRY.

220. Proposed by G. B. M. ZERR, A. M., Ph. D., Parsons, West Va.

Two triangles are circumscribed to a given triangle ABC , having their sides perpendicular to the sides of the given triangle. Prove that the two triangles are equal, and find the area of these triangles.

III. Solution by J. SCHEFFER, Kee Mar College, Hagerstown, Md.

Let $A'B'=c'$ be the side of the circumscribed triangle drawn through B and perpendicular to AB , $A'C'=b'$ through A and perpendicular to AC , and $B'C'=a'$ through C and perpendicular to BC . It is seen at once that triangle $A'B'C'$ is equiangular with triangle ABC . We have